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NATIONAL AIRSPACE INTEGRATED LOGISTICS SUPPORT (NAILS) MASTER PLAN

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DEPARTMENT OF TRANSPORTATION
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Initiated By: AES-110

The National Airspace Integrated Logistics Support (NAILS) Master Plan provides requirements and task descriptions governing the implementation of a NAILS program during the life cycle of the National Airspace System (NAS) equipment.

The goal of this plan is to develop a single, uniform approach for conducting those activities necessary to (1) cause supportability requirements to be an integral part of system requirements and design, (2) define support requirements that are optimally related to the design and to each other, (3) define the required support during the operational phase, and (4) prepare attendant data products.

This plan identifies specific requirements and tasks, as well as roles and responsibilities, which, when performed in an iterative and timely manner, constitute the NAILS program for the NAS.

This version of the plan is not in the FAA directive format. However, this plan will be updated and a major revision is scheduled during the second quarter of FY-87. The revised plan shall be prepared using the order format described in Order 1320.1C, FAA Directives System. Any recommended changes to this plan should be forwarded to AES-100 prior to the scheduled revision.

This plan is applicable to all NAS subsystem acquisitions.

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Acting Associate Administrator
for Development and Logistics

CONTENTS

ACRONYMS AND ABBREVIATIONS

AAC	Aeronautical Center
ACCC	Area Control Computer Complex
ADP	Automatic Data Processing
AES	Systems Engineering Service
AF	Airway Facilities
AFS	Airway Facilities Sector
ALG	Acquisition and Materiel Service
APM	Program Engineering and Maintenance Service
APT	Office of Personnel and Technical Training
ARTCC	Air Route Traffic Control Center
AT	Air Traffic
ATC	Air Traffic Control
ATE	Automatic Test Equipment
ATR	Air Traffic Requirements Service
BIT	Built in Test
BITE	Built in Test Equipment
CBI	Computer Based Instruction
CDS	Computerized Dispatch System
CRT	Cathode Ray Tube
DRS	Dedicated Repair Service
F&E	Facilities and Equipment
FAA	Federal Aviation Administration
FAATC	FAA Technical Center
GNAS	General NAS Sector
ILSP	Integrated Logistics Support Plan
ISD	Instructional System Development
ISP	Integrated Support Plan

LCN	LSA Control Number
LIS	Logistics and Inventory System
LRU	Line Replaceable Unit
LSA	Logistics Support Analysis
LSAP	Logistics Support Analysis Plan
LSAR	Logistics Support Analysis Record
MCC	Maintenance Control Center
MMS	Maintenance Management System
MPS	Maintenance Processor Subsystem
NAILS	National Airspace Integrated Logistics Support
NAILSMT	National Airspace Integrated Logistics Support Management Team
NAS	National Airspace System
NFSS	National Field Support Sector
OLSA	On-line Logistics Support Analysis
PHS&T	Packaging, Handling, Storage, and Transportation
PLATO	Programmed Logic for Automatic Teaching Operations
PM	Preventive Maintenance
RDCC	Research and Development Computer Complex
RFP	Request for Proposal
RIA	Repair Level Analysis
RMMS	Remote Maintenance Monitoring System
SE	Support Equipment
SEI	System Engineering and Integration
SMR	Source Maintenance and Recoverability
SOW	Statement of Work
SRC	Sector Repair Center
SRU	Shop Replaceable Unit
SSCC	System Support Computer Complex
STP	Subsystem Training Plan
TASCS	Training Analysis Support Computer System
TCCC	Tower Control Computer Complex

1.0 INTRODUCTION

This NAILS Master Plan is designed to:

1) Identify NAILS requirements, and,

2) Explain how project NAILS programs are incorporated into the overall NAS structure.

A disciplined, unified, and iterative approach to the logistics management and technical activities governing the support of NAS projects will be detailed in the Integrated Logistics Support Plan (ILSP) for each NAS project. The principal tool for defining and documenting support resource requirements is the Logistics Support Analysis (LSA).

1.1 NAILS POLICY

Order 1800.XX establishes policy for the NAILS process in the NAS subsystem/equipment acquisitions, modifications, and applicable research and development projects. This policy is applicable to all FAA organizations.

1.1.1 NAILS Policy Responsibilities

The Associate Administrator for Development and Logistics, ADL-1, has the overall responsibility for the development and implementation of the NAILS policy. Other organizations responsible for implementation and execution of the NAILS Master Plan include:

1) Systems Engineering Service (AES) - This service is responsible for the development, monitoring, and maintenance of the NAILS policy. It is also responsible for the monitoring of related plans and standards for conformance to the NAILS policy.

2) Program Engineering and Maintenance Service (APM) - This service is responsible for implementing the NAILS process and the development and maintenance of related directives. APM is also responsible for

implementing and monitoring NAILS efforts on project acquisitions. APM-12 is responsible for the initial budget line required for a NAILS program, with follow-on budget management to be managed by the cluster organizations.

3) Office of Personnel and Technical Training (APT) - This office is responsible for the development of personnel and training standards, procedures, and systems to support the NAILS process.

4) Acquisition and Materiel Service (ALG) - This service is responsible for the development of required acquisition policies, plans, and standards required to support the NAILS process.

5) Mike Monroney Aeronautical Center (AAC) - The Aeronautical Center is responsible for the training, repair, and materiel system(s) required to support the NAILS process.

6) FAA Technical Center (FAATC) - The FAATC is responsible for supportability testing and verification of NAS subsystems.

7) FAA Regional Offices - Regional offices are responsible for the installation and maintenance of the NAS and the management of field support resources in support of the NAILS process.

8) Air Traffic Requirements Service (ATR) - This service is responsible for identifying and coordinating operational training requirements necessary to support the NAILS process.

1.1.2 Maintenance Roles and Responsibilities

The Airway Facilities Sector (AFS) will continue to be the principal element in the maintenance program. The following paragraphs further detail the organizations involved in maintaining NAS subsystems.

1.1.2.1 Regional Offices/Washington Headquarters

The NAS Plan will increase the need for technical support of national programs through the regional AF Divisions to accomplish functions that are not practical to delegate to the sectors. The following are representative examples of such functions; frequency management, airspace reviews, technical inspection programs, coordination of technical support requirements, etc.

1.1.2.2 National Field Support Sectors (NFSS)

NFSS's will provide second-level engineering support with an emphasis on resolution of systemwide and national problems associated with system integration and implementation, as well as engineering support, for the resolution of difficult local problems. The NFSS's perform the following functions; analyze and correct systemwide or national problems, assist sectors in diagnosing difficult site problems, develop and control hardware and software modifications, and provide functional improvement to diagnostics, test, maintenance, and utility programs.

1.1.2.3 FAA Depot

The FAA Depot will provide repair of unserviceable, repairable items requiring specialized repair procedures, test equipment/tools, diagnostic hardware/software, major shop facilities, etc.. Examples of such activities include: repair, alignment, and calibration of complex equipment and modules; overhaul and rebuilding of equipment; performance of highly complex maintenance actions; and supply support.

1.1.2.4 FAA Academy

The FAA Academy conducts resident in-depth, hands-on training on specific hardware/software systems, as well as developing multimedia courses, to support increased sector training and Computer Based Instruction (CBI), direct technical support upon request, and technical/administrative resources for regional training programs.

1.1.2.5 Sector Office

The sector's mission is accomplished through various organizational entities. Air Route Traffic Control Centers (ARTCC) and General NAS (GNAS) Sectors will include a Maintenance Control Center (MCC) and provide administrative and technical support functions. The MCC is the central focus for maintenance functions and will normally be the location for the Remote Maintenance Monitoring System (RMMS) computers. Work centers located within a sector will provide the data necessary to maintain the remote facilities for which it has maintenance responsibility through radio/telephone communications capable of effectively dispatching, redirecting, and managing the work centers' personnel.

1.2 NAILS DOCUMENTATION HIERARCHY

The documentation hierarchy in Figure 1.2-1 depicts the process involved in developing the required project support documentation. The key component within this structure is the NAILS Master Plan.

1.3 APPLICABLE DOCUMENTS

Order 1100.2	FAA Organization - FAA Headquarters
Order 1100.5	FAA Organization - FAA Field
Order 1320.1C	FAA Directives System
Order 1800.8E	NAS Configuration Management
Order 3000.6	Training
Order 3000.10	Airway Facilities Maintenance Technical Training Program
Order 6000.10	Airway Facilities Service Maintenance Program
Order 6000.27	Maintenance Philosophy Steering Group Report Update
Order 6000.30	Airway Facilities Service Policy Decisions for the Maintenance Program of the 1980's

FAA-E-2734	MMS Specification
FAA-STD-021	Configuration Management (Contractor Requirements)
FAA-STD-028	Contractual Training Programs
NAS-MD-001	NAS Subsystem Baselined Configuration and Documentation Listing
11/1/85 Draft	LIS Conceptual Design Document
04/85	NAS Plan Facilities, Equipment and Associated Development
10/84 Draft	MMS Program Plan
06/84 Draft	MMS Interface Requirements Document
05/01/86	LIS Interface Control Document
12/17/84	Maintenance and Operations Support Plan
MIL-STD-1369	Integrated Logistics Support Program Requirements
MIL-STD-1388-1A	Logistics Support Analysis
MIL-STD-1388-2A	DOD Requirements for Logistics Support Analysis Record
MIL-STD-1521	Technical Reviews and Audits for Systems Equipment and Computer Software
MIL-STD-1561	Provisioning Procedures, Uniform DOD
DOD 4100.38-M	Provisioning and Preprocurement Screening Procedures
DOD 5000.39	Acquisition and Management of ILS for Systems and Equipment

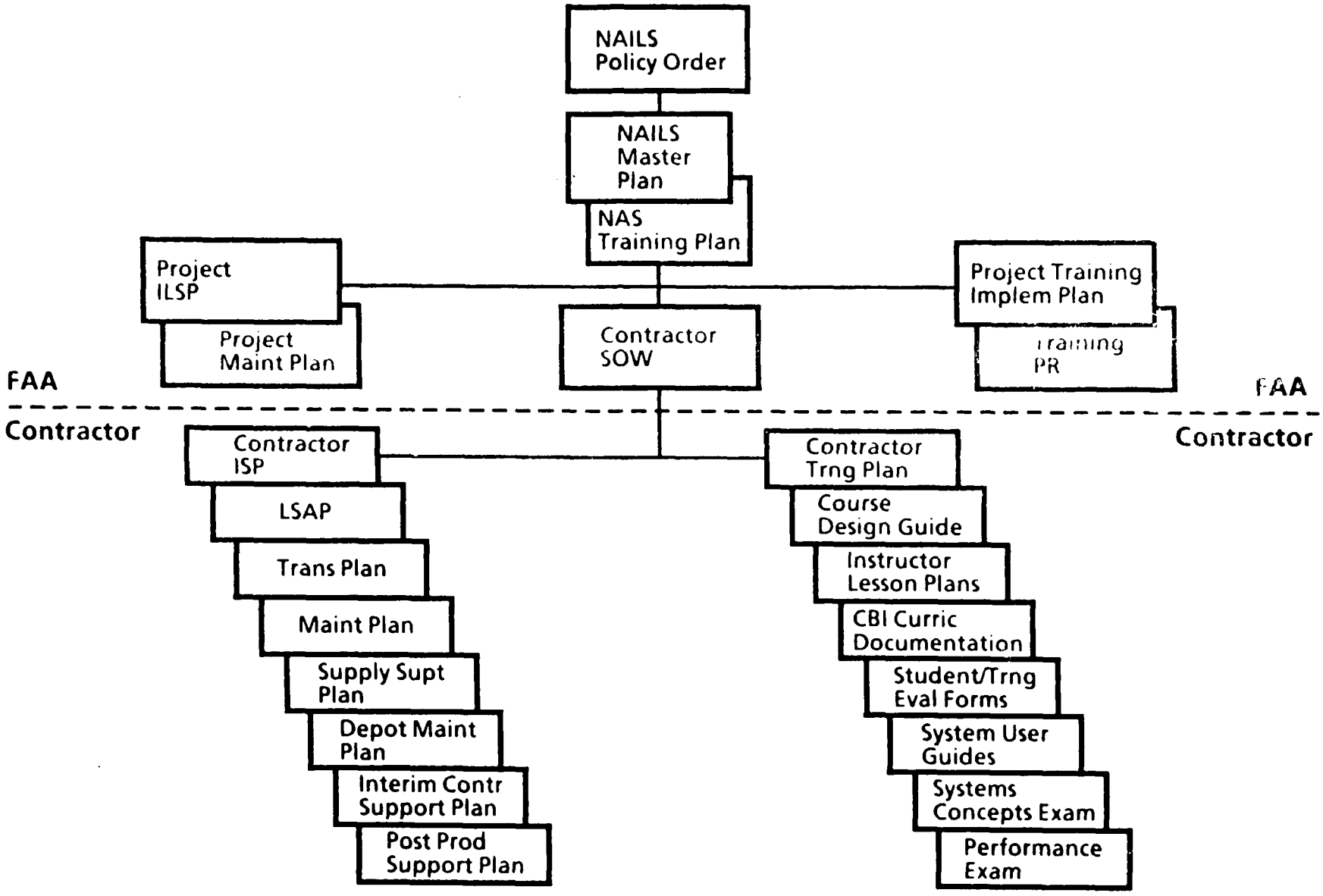


Figure 1.2-1 NAILS Documentation Hierarchy

2.0 NAILS MANAGEMENT

The primary objective of a NAILS program is to achieve NAS objectives at an economical life-cycle cost. Early NAILS program activity focuses on determining the required support characteristics and incorporating these requirements into system design. Subsequent activity focuses on acquisition, evaluation, and fielding of support resources required to support system implementation.

A NAILS program will ensure the definition of tailored support needs and will identify, develop, and integrate logistics design parameters directed at reducing operational and maintenance costs. It will define NAILS within the system engineering process, and it will stress design considerations to incorporate maintainability and reliability criteria and applicable principles of NAILS to minimize the sum of acquisition, operation, and support costs.

The NAILS objective will be met through intensive management of the following NAILS elements throughout the life cycle of the NAS subsystem projects:

1) Maintenance Planning

2) Supply Support

3) Support Equipment (SE)

4) Training and Training Support

5) Manpower and Personnel

6) Maintenance Support Facilities

7) Packaging, Handling, Storage, and Transportation (PHS&T)

8) Technical Data

2.1 MANAGEMENT RESPONSIBILITIES MATRIX

The matrix in Figure 2.1-1 depicts the roles and responsibilities of both the FAA and the System Engineering and Integration (SEI) contractor necessary to ensure that a NAILS program and its subordinate elements are carried out.

2.2 INTEGRATED LOGISTICS SUPPORT PLAN (ILSP)

An ILSP is developed for each acquisition project. The purpose of the ILSP is to describe the Government's detailed approach to integrate logistics considerations and logistics planning into the engineering and design process for each NAS subsystem. In the ILSP, the Government provides support criteria and concepts for the NAILS program. The ILSP describes a phased program of Government and contractor actions which are dynamic and change with the progress of end item and NAILS development. Figure 2.2-1 identifies the major activities involved in a NAILS program and how these activities relate to major program milestones. The ILSP states Government requirements and will be updated as required during the life of the contract.

2.3 INTEGRATED SUPPORT PLAN (ISP)

A preliminary ISP will be developed by each project contractor in accordance with the Request For Proposal (RFP) and Statement of Work (SOW). This plan explains the contractor's approach for implementing the NAILS program for the system under contract. The preliminary plan will be submitted to the FAA for review and comment. After FAA approval, the ISP becomes the contractual document governing the contractor's NAILS effort. It is kept current throughout the contract period of performance. The ISP may include the following sub-plans, to the degree specified in the RFP/SOW.

NAILS ELEMENT:	CONCEPT EVALUATION	DEMONSTRATION AND VALIDATION	FULL-SCALE DEVELOPMENT	PRODUCTION AND IMPLEMENTATION
Maintenance Planning	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Supply Support	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Support Equipment	AAC Depot ACT-500 AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Training and Training Support	AAC Academy AAT-700 AES-100 ALG-200 APT-300 APM-100 APM (Clusters) SEI Contractor	AAC Academy APM (Clusters) SEI Contractor AAT-700 APM-100 APT-300	AAC Academy APM (Clusters) SEI Contractor AAT-700 APM-100 APT-300	AAC Academy APM (Clusters) SEI Contractor AAT-700 APM-100 APT-300
Manpower and Personnel	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Maintenance Support Facilities	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Packaging, Handling, Storage, & Transportation	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Technical Data	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor AAC Academy	APM-100 APM (Clusters) SEI Contractor AAC Academy	APM-100 APM (Clusters) SEI Contractor	APM-100 APM (Clusters) SEI Contractor

Figure 2.1-1 NAILS Management Responsibilities Matrix

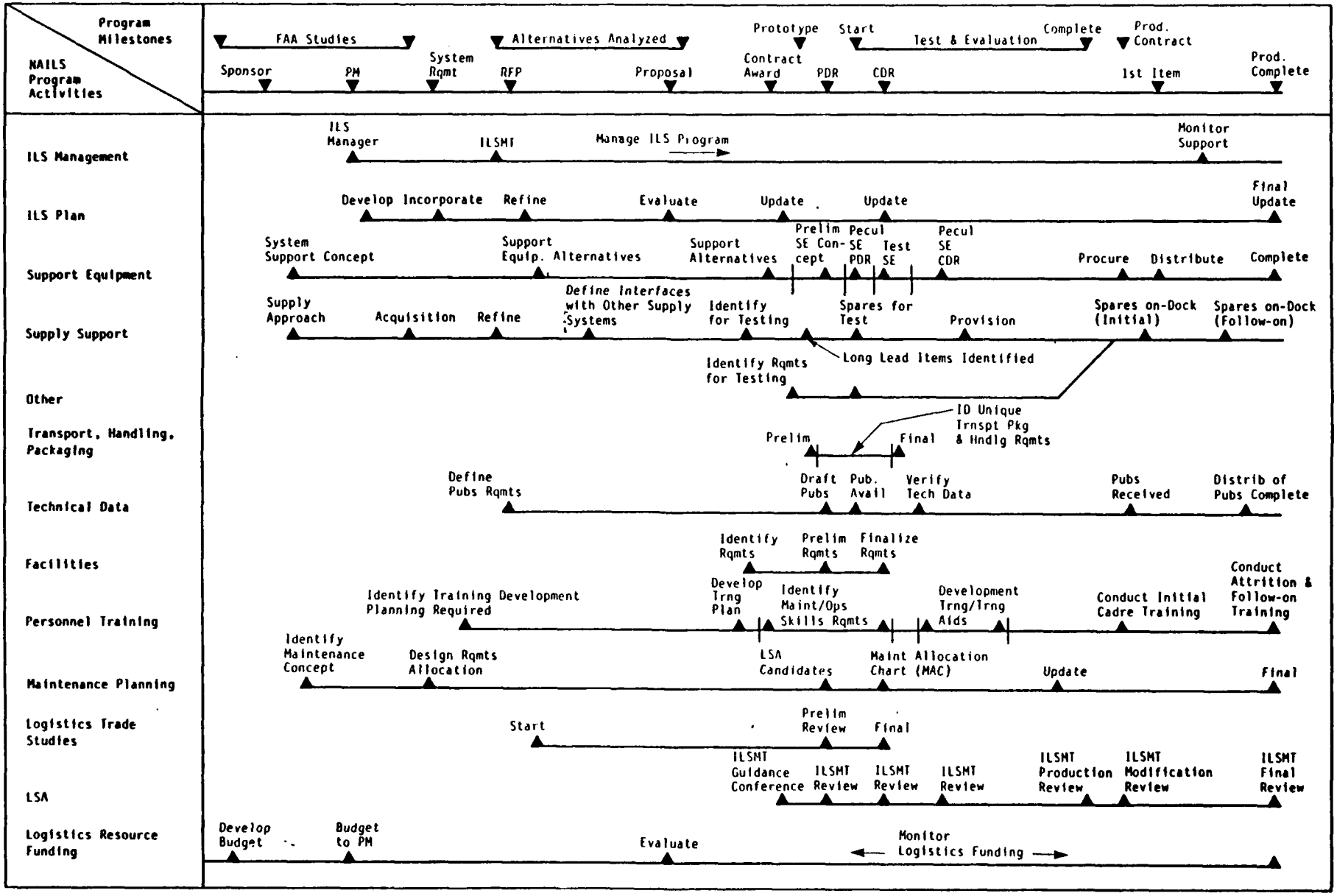


Figure 2-1 NAILS Activities by Program Milestones

2.3.1 Logistics Support Analysis Plan (LSAP)

The LSAP is prepared by the contractor to describe the way in which the LSA effort is to be accomplished. The LSAP is submitted as part of the contractor's ISP. The LSAP covers the following topics:

1) Work breakdown structure identification of items upon which LSA will be performed;

2) An explanation of the LSA Control Number (LCN) system to be used;

3) Procedures for incremental development and validation of LSA data to include data configuration control;

4) The procedures, methods, and controls for identifying and recording design problems or deficiencies affecting supportability, corrective actions, and status of actions taken to resolve issues or concerns;

5) A description of the contractor data, to be delivered under the terms of the contract, and how the data will be delivered;

6) An explanation of deviations from the standard Logistics Support Analysis Record (LSAR) format data sheets and new/modified data element definitions;

7) Contractor and/or subcontractor/vendor Automatic Data Processing (ADP) capabilities and equipment for processing LSAR data;

8) LSA program interfaces among:

   a) Reliability, maintainability, equipment design, human factors, safety, and other coincident design-related activities,
   b) The provisioning process,
   c) Technical manual/technical data development,
   d) Operator/maintenance training analysis.

2.3.2 Transportation Plan

This plan is developed by the contractor to describe the transportation requirements unique to the specific NAS subsystem. The Transportation Plan is normally developed during the acquisition phase and will be used by the shipment planning organization.

2.3.3 Maintenance Plan

The Maintenance Plan identifies the contractor's method for identifying and developing the required maintenance activities necessary for system support. The plan provides a concise narrative of the maintenance actions, technical factors for each repairable item, and the identification of the system/equipment maintenance requirements.

2.3.4 Supply Support Plan

This plan provides the Government with the methodologies behind the contractor's proposed supply support system. The plan will identify the supply support requirements, as well as a recommended philosophy, to ensure that those requirements are available in a timely manner.

2.3.5 Depot Maintenance Plan

The Depot Maintenance Plan is essentially the documented results of a depot maintenance study, used to evaluate the manpower, skills, tooling, and facilities required for depot support. The plan identifies the steps required to ensure that the FAA Depot will be capable of supporting a particular NAS subsystem.

2.3.6 Interim Contractor Support Plan

This plan will detail the contractor's role (if any) in supporting the initial operation of a fielded subsystem. This support plan will also describe the requirements necessary to support a system between initial installation and the point in time when the FAA accepts support responsibility. In addition, this plan will describe the elements required to support the system test program to be accomplished by the contractor.

2.3.7 Post Production Support Plan

This plan identifies the logistics support resources required to support a subsystem/equipment for its remaining life following closure of the production lines. This plan will also include the methods recommended to satisfy the resource requirements.

2.4 CONTRACTOR TRAINING PLAN

A contractor-prepared document which outlines the strategy for training course development and conduct. It must be approved by the FAA contracting officer before development of the Course Design Guide can proceed.

2.4.1 Course Design Guide

A method of translating an approved training plan into a blueprint for course development. It is useful to curriculum developers and supervisors during curriculum development and validation phases of course development.

2.4.2 Instructor Lesson Plan

This plan is used to organize the instructor's presentation and to ensure that all required topics, subtopics, and related reference materials are included in the presentation. This plan also provides the detailed technical data and information necessary to assist the instructor in the presentation of each lesson involved in the course.

2.4.3 Computer Based Instruction (CBI) Curriculum Documentation

The Program Logic for Automatic Teaching Operations Learning Management permits a wide range of adaptability in curriculum design. Specific design data is provided to establish the options for curricula selection in a standardized manner.

2.4.4 Student/Training Evaluation Forms

A continual evaluation program used to determine students' progress toward meeting course objectives. The program consists of pre-tests (if applicable), progress tests, and post-tests. Student progress is continuously evaluated by the instructor through class discussion, interviews, practical application exercises, and special projects, as well as written performance tests.

2.4.5 System User Guides

A "Quick Reference" or "How to" manual for FAA specialists who will be formatting messages or data entries, inputting and extracting data from system software, powering up/down a system, operating peripheral devices and changing control/switch/knob settings, initiating diagnostic or Built-in-Test Equipment (BITE) testing routines, and interpreting test result messages.

2.4.6 Systems Concepts Exam

An examination for which successful completion enables the examinee to be exempt from, or by-pass, formal course training. Also known as a "Theory of Operation" or "By-pass" exam, it is a written examination.

2.4.7 Performance Exam

An examination used to demonstrate proficiency by having the examinee make actual adjustments or software program changes and evaluate system/subsystem equipment operation.

2.5 LOGISTICS SUPPORT ANALYSIS (LSA)

LSA is a series of analyses used to determine the logistics requirements for each of the NAILS elements. Examples of LSA data outputs include; number of spares, repair parts and consumables, consumption and usage rates, recommended allowances, supply storage requirements, maintenance concept, SE requirements, maintenance tasks, personnel requirements, and technical documentation.

2.5.1 LOGISTICS SUPPORT ANALYSIS RECORD (LSAR)

Data and information generated by the LSA process is documented in a series of analysis worksheets called an LSAR. This record provides a common data input format for communicating logistic support requirements between the contractor and the Government. LSAR worksheets will be prepared and processed concurrently with design to ensure a basis for logistics resource planning and tradeoff decisions is established prior to hardware design freeze. Each project contractor will prepare LSAR data sheets formatted in accordance with MIL-STD-1388-2A as tailored by the RFP/SOW. Contractor proposals for substitution of other formats or the alteration or deletion of the specified formats or data elements requires FAA/SEI contractor approval. Where the LSAR data sheets do not provide sufficient space for free text, the contractor will use continuation sheets in the format prescribed by MIL-STD-1388-2A.

2.5.2 On-Line Logistics Support Analysis (OLSA) System

The OLSA system provides real-time access to project support LSA information. The LSAR data is entered into the OLSA data base and used as a single analytical management tool. The LSAR data can then be sorted by OLSA and processed as a batch report. The OLSA system is resident on the SEI contractor mainframe for use both by the FAA and the SEI contractor.

The OLSA system permits the FAA/SEI contractor to have full participation in the LSA/LSAR process. The OLSA system uses cathode ray tubes for direct entry and inquiry of data to and from the computer files. Consequently, the FAA/SEI contractor will have access to all LSA data provided by the project contractor.

The OLSA data base will be developed using the Government-approved LSAR data. The method for transmitting data can be one of several ways, depending upon the ADP capabilities of the contractor. Data may be transmitted by magnetic tape or hard-copy data sheets. Once the LSAR data is approved and resident in the OLSA system, updates will be made as required to incorporate design changes.

2.6 NAILS MANAGEMENT TEAM (NAILSMT)

NAILSMT's are formed to assist the program/project manager in planning, monitoring, and controlling a project contractor's NAILS activities. The NAILSMT will be responsible for:

1) Developing RFP/SOW tasks for each project/equipment acquisition;

2) Evaluating proposals;

3) Assisting in the negotiation of NAILS activities with the contractor;

4) Conducting formal/informal incremental review of data being developed;

5) Approving all LSA tasks;

6) Evaluating impacts of each contractor's LSA data against all NAS projects;

7) Providing direction to the project/equipment contractor on matters pertaining to logistics support;

8) Resolving supportability issues and concerns;

9) Identifying MIL-STD-1388-2A data elements required for the LSAR data applicable to the project;

10) Providing formal comments based on assessments of program and design reviews; and

11) Establishing an effective working interface with the project/equipment contractor in order to accomplish the established NAILS goals.

2.6.1 NAILSMT Composition and Responsibilities

The NAILSMT shall be composed of FAA headquarters/Aeronautical Center/FAA Technical Center and SEI individuals highly qualified in the logistics disciplines. Primary team members must be identified for all project/equipment acquisitions. Support members shall be identified, to assist in their areas of expertise, as required. Each contractor executing a NAILS program is required to establish an in-house NAILSMT comparable to the Government team and functioning in accordance with the Government team guidelines. NAILSMT composition and responsibilities are outlined in Table 2.6.1-1.

Table 2.6.1-1 NAILSMT Composition and Responsibilities

Function	Type Member	Organization	Responsibility
NAILSMT Chairman	P	Program/Project Manager (APM/AAP)	Chair, Plan, and Coordinate all NAILS Functions
	P	APM-100	Assist the NAILSMT Chairman
	P	SEI Contractor	Assist the NAILSMT Chairman
NAILSMT Secretariat	P	SEI Contractor	Record Meeting Minutes, Track Action Items
Maintainability	S	APM-120 SEI Contractor AAC Depot	Maintainability Interface
Reliability	S	APM-120 SEI Contractor ACT-500	Reliability Interface
Supply Support/ Provisioning			

P - Primary Member

S - Support Member (will support NAILSMT on an "as-required" basis)

Table 2.6.1-1 (cont)

Function	Type Member	Organization	Responsibility
- Common	S	AAC Depot SEI Contractor	Common Repair and Support Requirements
- Peculiar	S	AAC Depot SEI Contractor	Peculiar Parts
Support Equipment	S	APM-120 SEI Contractor AAC Depot APM-150 APM-160	Requirements Definition and Procurement
Training and Training Support			
- Operations	S	APT-300 AAT-700 AAC-930 SEI Contractor	Operations Training, Identify Requirements and Concepts
- Maintenance	S	APM-110 AAC Depot AAC-940 APT-300 SEI Contractor	Maintenance Training, Identify Requirements and Concepts

Table 2.2.1-1 (cont)

Function	Type Member	Organization	Responsibility
Logistics Engineering Analysis Review	S	APM-120 AAC Depot ALG-200 SEI Contractor	Logistics Support
Manpower and Personnel	S	APM-130 APM-110 AAC Depot SEI Contractor	Personnel and Staffing Requirements and Classification
Technical Data	S	APM-120 APM-150 APM-160 SEI Contractor	Development of Manuals
Packaging, Handling, Storage, and Transportation	S	AAC Depot SEI Contractor	Equipment and Spares Packaging, Handling, and Transportation Requirements

Table 2.6.1-1 (cont)

Function	Type Member	Organization	Responsibility
Maintenance Support Facilities	S	APM-120 ALG-200 SEI Contractor	Maintenance Support Facilities Requirements
Configuration Management	S	AES-410 SEI Contractor	Configuration Management and Standardization
Life-Cycle Cost	S	APO-200 ALG-200 SEI Contractor	Life-Cycle Cost/ Requirements/Constraints

For the Host Computer and Advanced Automation Systems, APM-240 and APM-250 will perform the functions listed above currently performed by APM-120.

3.0 NAILS ELEMENTS

3.1 MAINTENANCE PLANNING

Maintenance planning is the process used to evolve and establish maintenance concepts and requirements during the life cycle of a NAS subsystem. The maintenance planning element is also the interface point with other organizations regarding matters that bear on system support. It coordinates with system designers to ensure that logistics factors are considered in system design.

3.1.1 NAS Maintenance Requirements

The NAS Plan will introduce newly developed technologies to improve subsystem availability and reliability. The NAS projects focus on controlling the growth of the maintenance work force and operating costs without adversely affecting services provided to the users of FAA facilities. This concept will reduce on-site maintenance through remote monitoring and control of facility parameters. There are two commonly used terms which identify the repair components used in the NAS maintenance concept; these are:

1) Line Replaceable Unit (LRU) - An LRU is the lowest unit to be replaced within the operating system during site level maintenance activities. It is a separate, installable physical package performing a single function or group of closely related functions.

2) Shop Replaceable Unit (SRU) - An SRU is the lowest unit required to repair an LRU at an intermediate or depot maintenance facility.

3.1.1.1 Repair Level Analysis (RLA)

The RLA is an analysis technique used to determine if it is cost-effective to repair or discard a support item. It also provides the information required to determine at which level of maintenance a repairable component can be most economically repaired. It is anticipated that only a small portion of repair decisions will require the use of a formal RLA to assist in repair level determination. A typical RLA decision tree is depicted in Figure 3.1.1.1-1.

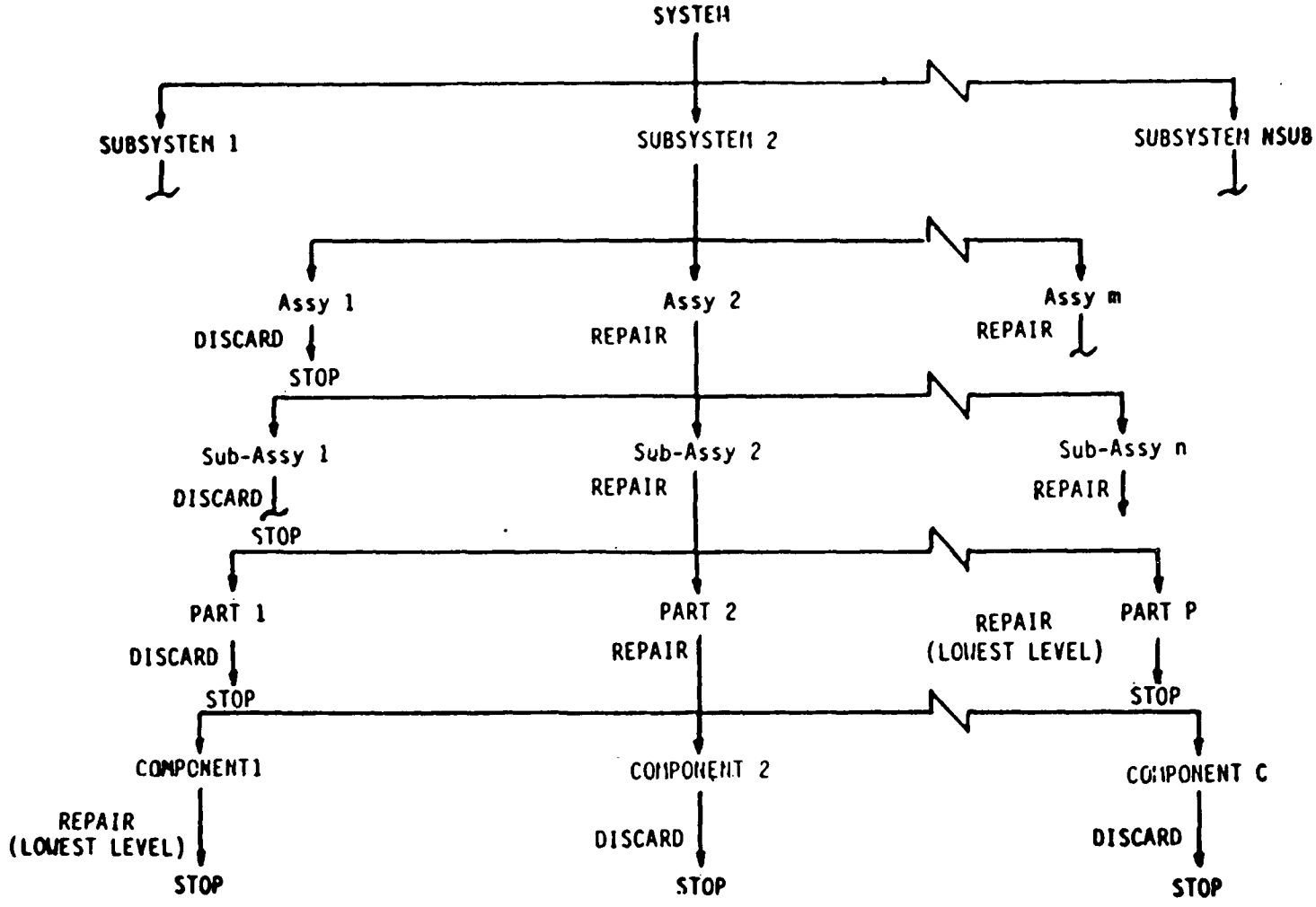


Figure 3.1.1.1-1 Typical RLA Decision Tree

3.1.2 NAS Maintenance Concept

The following maintenance concept is predicated upon Draft Order 6000.27A. The NAS maintenance concept is to provide a capability to restore a system to operation as quickly as possible by using one of several techniques. The maintenance system supporting the NAS during this period will be equipment intensive, rather than personnel intensive, and will rely upon solid-state technology to reduce maintenance expenditures. Through modularization, site maintenance will move from labor intensive on-site repair to LRU replacement. The maintenance system will place emphasis on the detection of faults and failures through remote monitoring of equipment. As a result, operational data will be provided to the MCC where a systems analyst will determine equipment status, provide notification to a work center of equipment malfunction, and aid in determining the required resources necessary for repair of a system. The work center will analyze the failure and identify the resources required to repair the system. Technical personnel will then be dispatched to remove the defective LRU and replace it with a serviceable LRU. Equipment certification will be accomplished, as required, either locally or remotely. The repairable LRU will be returned to the work center for repair (intermediate maintenance) or for shipment to the depot for repairs requiring specialized equipment and/or specialized personnel skills.

3.1.2.1 Automated Maintenance Systems

3.1.2.1.1 Remote Maintenance Monitoring System (RMMS)

The central provision of the NAS maintenance concept is the ability to monitor remotely the performance of NAS subsystems, measure equipment parameters, assist in system certification, predict imminent failures, and make compensating adjustments or corrections. The RMMS consists of electronic and electromechanical equipment that monitors, records, and evaluates performance parameters of all NAS subsystems. Maintenance consoles within the MCC and terminals at work centers will provide an alert to systems specialists of critical conditions, allow system and maintenance specialists to query the system for information, and allow the specialists to perform additional diagnostics from a work center. Portable data terminals will be used by specialists on-site to obtain immediate status information relative to a site facility.

Based on the collective information obtained through RMMS, actions can be identified to improve facility performance, anticipate equipment failures, and enable the equipment specialist to schedule maintenance actions to minimize failures.

3.1.2.1.2 MCC

The MCC is a single central control location which will be located at the node of the RMMS network. The RMMS will provide the primary quality assurance interface between the MCC and the unmanned facilities and equipment to be monitored. The MCC will be equipped with a variety of voice and data communications links to the Airway Facilities (AF) and Air Traffic (AT) field maintenance and user organizations in order to provide secondary or backup quality assurance for maintenance functions beyond the scope of the RMMS. With these primary and secondary interfaces providing direct access to facilities, work centers, support groups and users, the MCC will have the capability to respond to all quality assurance and maintenance requirements generated within its area of jurisdiction.

3.1.2.1.3 Maintenance Management System (MMS)

The MMS is a technical and administrative support system that automates the collection, storage, analysis, and distribution of data. It offers technical field personnel and all levels of management the capability to input, access, and process information. The overall objective of the system is to improve the cost-effectiveness of maintenance operations in support of the NAS. The MMS is an entity in software within the RMMS. Data management functions are performed by the Maintenance Processor Subsystem (MPS). Data entry and display functions are performed by associated input/output devices. Information can be requested on schedule or as needed from field sites, sector and regional offices, Washington headquarters, and the NFSS's. Historical files or problems and solutions on each system or equipment will be produced as required. This historical information will be analyzed to develop trends and predict failure situations.

3.1.3 Levels of Maintenance

3.1.3.1 Site Maintenance

Site maintenance consists primarily of maintenance activities performed on equipment installed in its operating environment. Specific functions to be performed at the site level are defined in the ILSP for each supported system.

Site maintenance involves Preventive Maintenance (PM), minor operational adjustments, removal and replacement of unserviceable LRU's, physical inspection, and verification of correct operation.

Site maintenance is conducted by personnel who are stationed at work centers. The equipment involved (the supported equipment) may be located at a remote site, or it may be located very near, perhaps in the same building as the supporting work center. The significant point is that site maintenance is performed on equipment in its operating location, wherever that may be.

3.1.3.1.1 Site Maintenance, Hardware

The chief features of the maintenance system, as applied to hardware at the site level, are:

1) System design will ensure that PM need not be scheduled more often than once every 90 days;

2) Failed system elements will be readily identified, largely through RMMS or built-in-test-equipment (BITE), with minimum necessity for fault diagnosis at the site;

3) Removal and replacement of failed LRU's;

4) System design will provide for rapid verification of the effectiveness of site maintenance activities;

5) Requirements for site maintenance training and SE are minimized; and,

6) Spares requirements will be limited to replacement LRU's and consumables. There will be little or no site maintenance requirements for repair parts.

3.1.3.1.1 Site Maintenance, Software

Site level software maintenance actions are primarily limited to removing and replacing defective software and firmware. As applied here, "site level" means within or in support of Area Control Computer Complexes (ACCC), Tower Control Computer Complexes (TCCC) or other FAA installations that are directly responsible for the FAA functions that the software supports. Software maintenance at this level is conducted by the groups engaged in software development and management.

3.1.3.2 Intermediate Maintenance

Intermediate level maintenance tasks are performed in those designated work centers which have the resources necessary for LRU repair and maintenance of SE.

3.1.3.2.1 Intermediate Maintenance, Hardware

The chief features of the maintenance system, as applied to hardware at the intermediate level, are:

1) Intermediate maintenance requirements will be relatively limited in comparison with current work center workloads;

2) In-shop test of LRU's and replacement of failed SRU's will only be authorized when cost effective at the intermediate level;

3) In-shop repair will be authorized on a less-extensive basis than is currently the case. Repair to the piece-part level will be infrequent;

4) Where repair is authorized at the intermediate level, LRU's will be returned to serviceability primarily through replacement of failed SRU's;

5) Requirements for training, SE, and supply support will be minimized;

6) A high proportion of failed items (SRU's or LRU's) will be forwarded to the depot for further action (repair or discard); and

7) Calibration and repair of SE as required. Where repair or calibration is not authorized, the SE will be forwarded to the depot.

3.1.3.2.2 Intermediate Maintenance, Software

At the intermediate level, software and firmware maintenance consists of two categories of maintenance: routine and emergency.

1) Routine maintenance involves the following types of maintenance effort:

   a) Perfective maintenance, performed to enhance performance, eliminate inefficiencies, or improve performance.
   b) Adaptive maintenance, performed in response to requirements peculiar to the local situation.
   c) Corrective maintenance, performed to correct deficiencies in software design.

2) Emergency maintenance is a special high priority version of corrective maintenance and is likely to be connected with safety, or with threatened curtailment of critical FAA mission capability. When safety-related or other software modifications requiring immediate action are identified at the site level, an emergency response team, made up of intermediate and FAATC representatives, will be formed to resolve the problem. Note that the differentiation between site, intermediate, and depot software maintenance is deemphasized in relation to emergency software maintenance.

3.1.3.3 Depot Maintenance

Depot level maintenance consists primarily of maintenance actions requiring skills and equipment that are so specialized that it is not cost effective to provide those skills and equipment at more than one location. The maintenance involved may consist of specialized repair of failed items, overhaul, or periodic refurbishment of equipment. Depot level maintenance may be conducted at the FAA Depot, at contractor facilities, or in the field by Government or contractor teams.

3.1.3.3.1 Depot Maintenance, Hardware

The primary features of the maintenance system, as applied to hardware at the depot level, are:

1) Repairs will be conducted to the piece-part level on more systems than currently has been the case;

2) Repairs of failed LRU's and SRU's may require the use of Automatic Test Equipment;

3) Depot level maintenance by the manufacturer or other commercial source will be employed where cost effective;

4) Equipment overhaul and refurbishment will continue to be a key depot function; and

5) Depot field teams will continue to be employed on occasions when local capabilities must be reinforced.

3.1.3.3.2 Depot Maintenance, Software

Software maintenance, like other aspects of software management, is controlled through a top-down, total system approach. Although not specifically defined as such, the overall management of the total software effort including the maintenance aspect, in effect, is the equivalent of a depot level function.

The software controlling authority (the depot), in the context of software maintenance, is the System Support Computer Complex (SSCC) at the FAATC. The SSCC is the focal point for creation and modification of software system version releases to operational sites and for providing diagnostic support to the sites.

Through interaction of the depot and the software management groups, maximum response to local concerns will be achieved, while also providing positive control and management of software, on a systemwide basis.

Software maintenance conducted by the FAATC includes all operational and support software for the ACCC's and TCCC's, as well as for the SSCC and the Research and Development Computer Complex (RDCC). These maintenance activities include, but are not limited to, the following:

1) Identifying problems;

2) Collecting supporting data;

3) Determining and implementing solutions;

4) Testing and verifying software versions including data bases and adaptation data files; and

5) Conducting configuration management, documentation, and quality control activities related to the management of software.

3.1.4 Maintenance Scenario

Air Traffic Control (ATC) operating systems will be monitored remotely. It will provide data to the MCC where the system analyst will determine equipment status and provide notification to a work center of an equipment malfunction and aid in determining required resources necessary to repair the system. Technical personnel will be dispatched to remove the defective LRU and

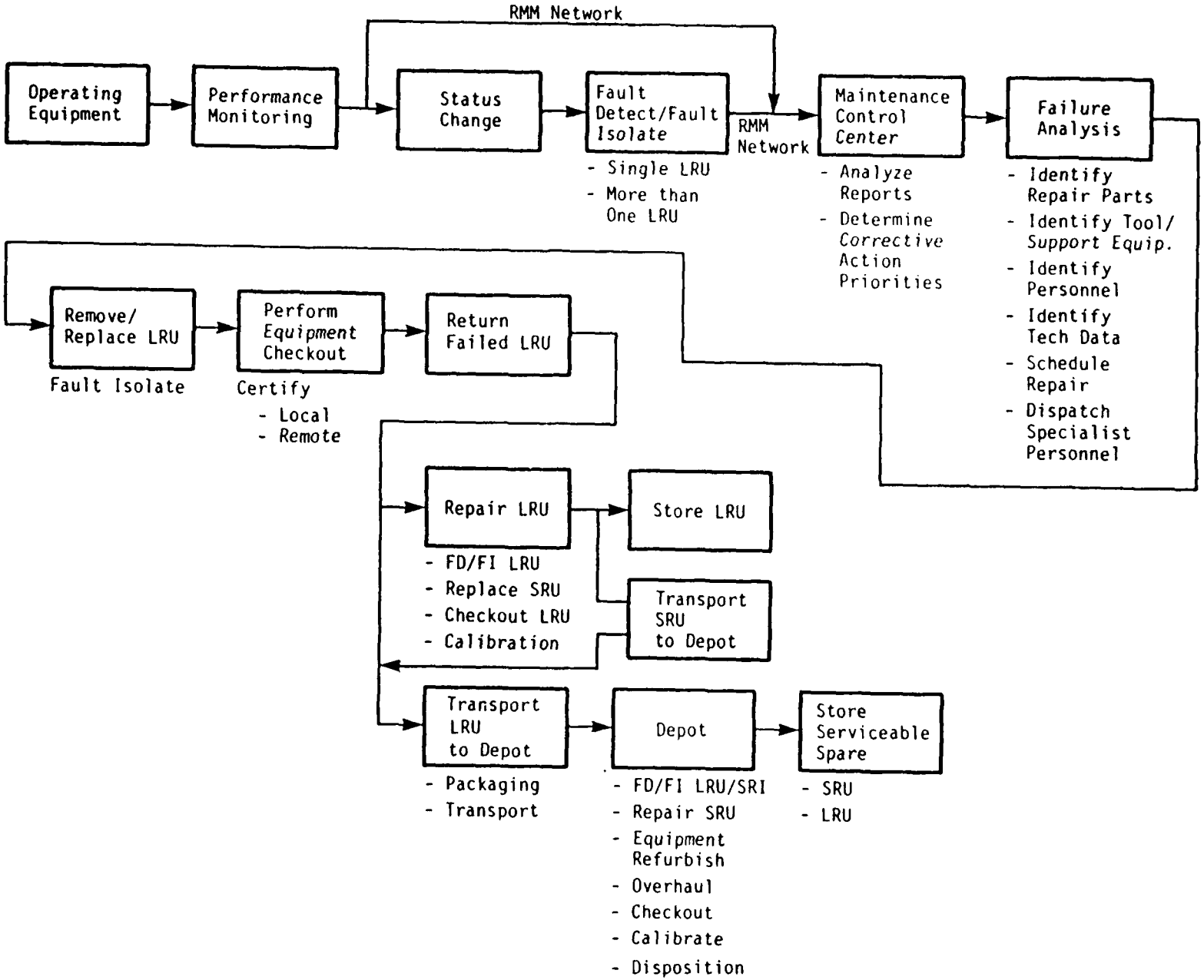


Figure 3.1.4-1 Typical Maintenance Scenario

replace it with a serviceable LRU. Equipment certification will be accomplished, as required, either locally or remotely. The repairable LRU will be returned to the repair center for repair or preparation for shipment to the depot for repair or disposition. Figure 3.1.4-1 depicts a typical scenario for a repair action.

3.2 SUPPLY SUPPORT

Supply support requirements are identified in the LSA. LSA is used to determine support requirements such as maintenance levels and consumption frequencies of spares, parts, and consumables. Supply data resulting from the LSA includes: identification of spares, repair parts, and consumables; establishment of consumption and usage rates, and recommended allowances; supply storage requirements; and Source, Maintenance, and Recoverability (SMR) coding.

3.2.1 Provisioning

Provisioning is the management process used to determine the quantity of support items required to operate and maintain NAS equipment for the initial period of operation. The LSA is the analytical base that provides key usage information and other data needed in the provisioning process. The provisioning process identifies the material that should be provided, to support a system under consideration, for a period of time during which usage rates will be determined, and the normal working of the supply system can be brought into play to replenish the spares, repair parts, and consumables as needed.

The emphasis on provisioning, and especially on the importance of determining requirements for spare and repair parts (and every other element of logistics) through LSA, contrasts markedly with a common practice of laying in complete sets of replacement items. Frequently, a "set" of spares is essentially a direct duplication of the supported system (less the mechanical portions). Usage rates, however, differ between the various LRU's and SRU's; consequently, some LRU's and SRU's are used rarely, some occasionally, and some frequently. A more analytical spares procurement process would show that

the "set of spares" approach often provides too many of some types of spares and too few of others; therefore, this approach is being phased out and replaced by the provisioning process. A provisioning conference will be held for each project acquisition in order to determine the spare/repair parts to be procured in support of system operation.

3.2.1.1 Spares Quantification

A spares quantification model is available for use during the provisioning process. This model utilizes a personal computer and is used to aid in determining the total number of spares required to support a NAS subsystem. The model will also be used to determine the stocking location of spares in order to provide optimum operational support.

3.2.2 Supply Support Automated Tools

The automated systems described below are designed to aid in efficient management of supply and maintenance programs.

3.2.2.1 OLSA

The OLSA system is used to house the LSA provisioning requirements which are identified by the contractor and approved by the FAA/SEI contractor. OLSA maintains these requirements to generate documentation used to procure the required supply support resources.

3.2.2.2 Logistics and Inventory System (LIS)

The LIS is a centralized inventory management system to be located at the FAA Depot. It will efficiently and effectively meet the needs of the NAS maintenance program by establishing an interface to the network of MPS's for the FAA Depot. This interface will provide an on-line mechanism by which FAA field personnel can request spare/repair parts and materials from the depot.

3.2.2.3 Computerized Dispatch System (CDS)

The CDS is an automated warehouse system utilized by the depot that will document and store information relating to receipt, issue, movement, and packaging and shipping information. The CDS also retrieves and delivers materials to the packaging location and provides the required shipping documentation.

3.2.2.4 Personal Property In-Use Management System II (PPIMS-II)

PPIMS-II is the updated version of the PPIMS property accountability system. PPIMS-II will improve the management, control, and accountability of FAA in-use personal property. Its goal is to develop standardized data elements, improve property management data, and widen the scope of property records. Uniform standard description of test equipment will be developed and maintained. Records will also include new information on usage data, maintenance costs, lease costs, and performance data. PPIMS-II will automatically track property transferred between regions and will access agencywide data through Washington headquarters.

3.3 SUPPORT EQUIPMENT (SE)

For each system, SE is identified by the LSA for each level of repair. The data produced by the LSA includes SE requirements, the maintenance level at which the item is required, the quantity of SE required per work center versus the number of supported systems, a description of the functions and capabilities of the SE, and all calibration requirements.

SE is divided into two groups of equipment; common and specialized. Common SE is procured through channels separate from, though often in association with, the acquisition of the supported item, ordinarily under the same procurement contract. Special precautions must be taken to ensure that SE for support of new systems is not procured if equivalent items already have been provided to work centers. SE identification for individual work centers is provided via the OLSA system.

3.3.1 Common SE

Common SE consists of equipment available for use on a number of maintenance tasks. It is commercially available without modifications. Equipment such as oscilloscopes, volt/ohmmeters, general purpose signal generators, common ATE, and hand tools will normally fall into this category.

3.3.2 Specialized SE

Specialized SE generally consists of equipment items custom designed to support maintenance activities. Included within this category of equipment are modified commercial items and specialized SE used to perform unique tasks. When economically feasible, specialized SE will have built-in-test capabilities to test the unit functionally before use.

3.3.3 AUTOMATIC TEST EQUIPMENT (ATE)

In order to support specialized maintenance actions and reduce human intervention, an emphasis is being placed on utilizing ATE. Equipment of this type can interrogate the elements and circuits of an electronic system with great rapidity. By identifying faults very quickly, such ATE can increase the speed and thereby reduce the cost of the testing process. Furthermore, by reducing reliance on human understanding and interpretation of electronics systems and analysis of internal circuitry by technicians, the need for expensive expertise is reduced.

ATE is also much more compatible with the testing requirements of miniaturized systems. Because the efficiency of ATE is recognized in the design process, most electronic components today are not testable through traditional manual means.

3.4 TRAINING AND TRAINING SUPPORT

Maintenance training tasks and training support requirements are identified via the task analysis documented in the LSA.

3.4.1 Training

Each project contractor shall deliver a full job task analysis which aids in the determination of requirements for training for that project. The LSA process cites requirements for training equipment, facilities, and curricula.

The maintenance concepts, state-of-the-art equipment design characteristics, and a full job task analysis for each system will be the minimum inputs for the determination of training requirements. The definition of the knowledge and skills required at each maintenance level is derived from those inputs and from the staffing criteria for each repair facility.

3.4.1.1 Certification Training

Certification of service availability and of system parameters will be performed at the facility periodically, as well as after maintenance restoration activities. Remotely located personnel will be capable of monitoring certification data via the RMMS. Those personnel with certification authority must themselves receive certification that they possess the knowledges and skills required to perform their duties.

3.4.1.2 Site Maintenance Training

Performance of regular PM tasks on the equipment, replacement of LRU's, system tests, and troubleshooting will require that the technical staff be trained in system concepts, equipment operation, alignment procedures, and configuration management.

3.4.1.3 Intermediate Maintenance Training

The repair of LRU modules at the work center will necessitate the training of sector personnel in the operation of specialized test equipment, operation of diagnostic software, microcircuit soldering techniques, and logistics procedures.

3.4.1.4 Depot Maintenance Training

Depot level repair will be conducted on modules, components, and SE and will require personnel to be trained in the operation and maintenance of specialized test equipment, diagnostic test beds, ATE, and software operations.

3.4.1.5 Logistics Training

With the planned implementation of the MMS and LIS, training requirements for operation and maintenance of these systems must be identified, planned for, and provided.

3.4.1.6 Program Support Training

With the proliferation of software-intensive systems being procured for implementation into the NAS, there will be increasing requirements for system support training such as systems analysis, system software officers, and programming positions.

3.4.2 NAS Training Plan

The NAS training plan provides summary NAS training information. It identifies projected impacts of the NAS Plan on FAA training, the activities of the NAILS training working group, and the methodology used to develop the NAS project training data base. The training plan is revised and updated on a semiannual basis. In its final form, the NAS training plan will be a single reference source to document the training activities and all training planning information affecting NAS projects.

Since the NAS training plan is designed to be a summary level document, detailed supporting documentation for each project is not included. This information is available in the Subsystem Training Plans and and can be obtained from the regional logistics/training representatives.

3.5 MANPOWER AND PERSONNEL

The direct maintenance manpower required for task accomplishment is identified in the LSA. The principal focus of this logistics element is to identify direct maintenance manpower required for the preventive and corrective maintenance of each NAS subsystem. This identification includes positive determination of the skills required, the number of people involved, and the time necessary to carry out each maintenance task.

The direct work staffing requirements identified by the manpower and personnel element, and documented in the LSA, are in turn used by the training and training support element in identifying training requirements. The direct work staffing requirements are also essential inputs to overall FAA human resources planning, which determines the numbers of individuals and their skills to be assigned to specific FAA organizations.

3.6 MAINTENANCE SUPPORT FACILITIES

Maintenance support facilities identification is the process for defining and implementing requirements for unique maintenance support facilities necessary to support the tasks identified in the LSA. The contractor will work closely with the depot, APM, and ALG to analyze maintenance support facility requirements. Requirements will be reviewed to ensure that adequate repair facilities exist, or that requirements are written and submitted to the FAA for acquisition of additional facilities.

3.7 PACKAGING, HANDLING, STORAGE, AND TRANSPORTATION (PHS&T)

LSA provides data pertaining to PHS&T support items. This effort provides feedback to design to ensure that support and test equipment, spares, and repair parts are designed (wherever possible) to be compatible with available modes of transportation and existing handling equipment.

3.8 TECHNICAL DATA

LSA provides maintenance and supply information essential for developing technical manuals, provisioning lists, and other documentation required for performing the tasks associated with equipment repair. Use of the LSA will contribute to preparation and delivery of accurate, adequate technical publications in a timely, economical manner.

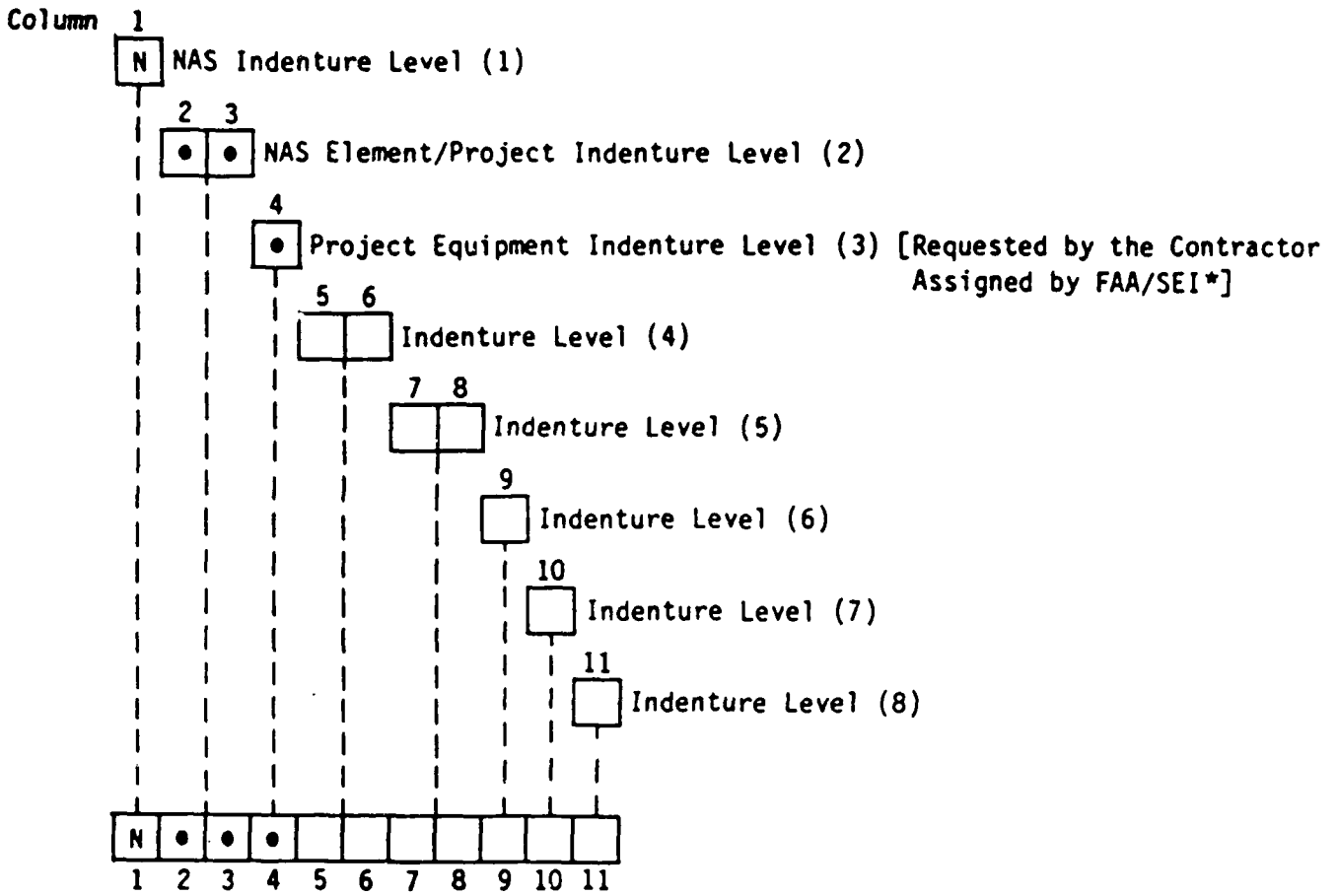
3.8.1 Technical Manuals

Technical manuals are required for all new, or contractor modified, equipment procured by the FAA. These manuals will be delivered in order to support equipment delivery and installation. This documentation will be developed in accordance with FAA-D-2494B.

APPENDIX A: LSA CONTROL NUMBER STRUCTURE

The following figures identify the NAS LCN structure. This appendix also identifies the LCN assignments for all NAS projects. Due to the evolving nature of the NAS, changes, additions, and deletions to the LCN assignments should be expected. When assigning LCN's or requesting current LCN structures, contact the SEI contractor, Logistics Engineering group.

The purpose for developing a structured LCN process for the NAS is twofold. First, by assigning a unique LCN for each NAS project the capability exists to track a project top-down-breakdown structure independently of other NAS projects. Second, a unique LCN structure allows for the automation of LSA data for use in the OLSA system.

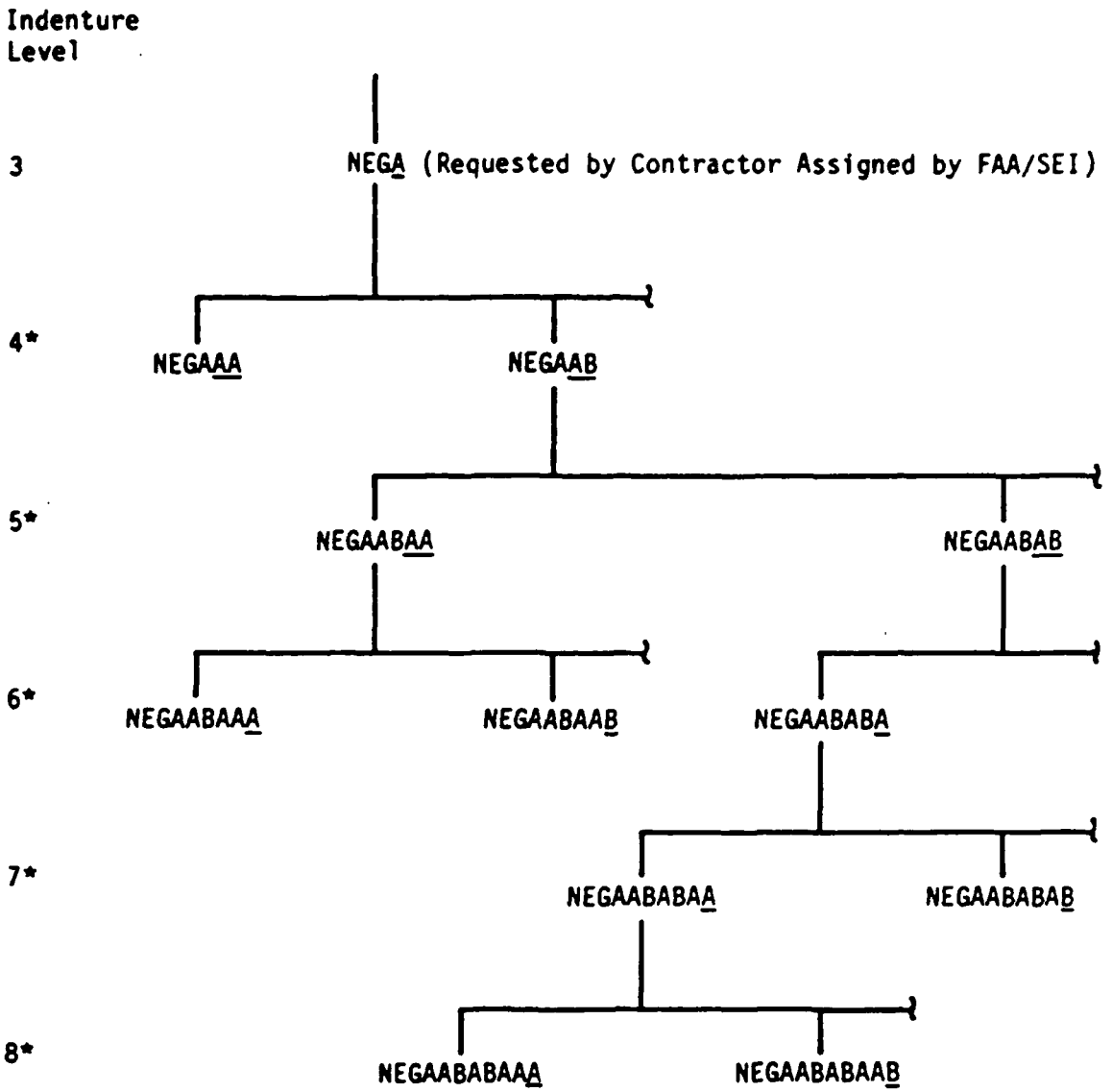


• Controlled and Assigned by FAA/SEI

* Column 4 Alpha Character "T" is Reserved for all Training-Unique Requirements for the Subsystems Identified

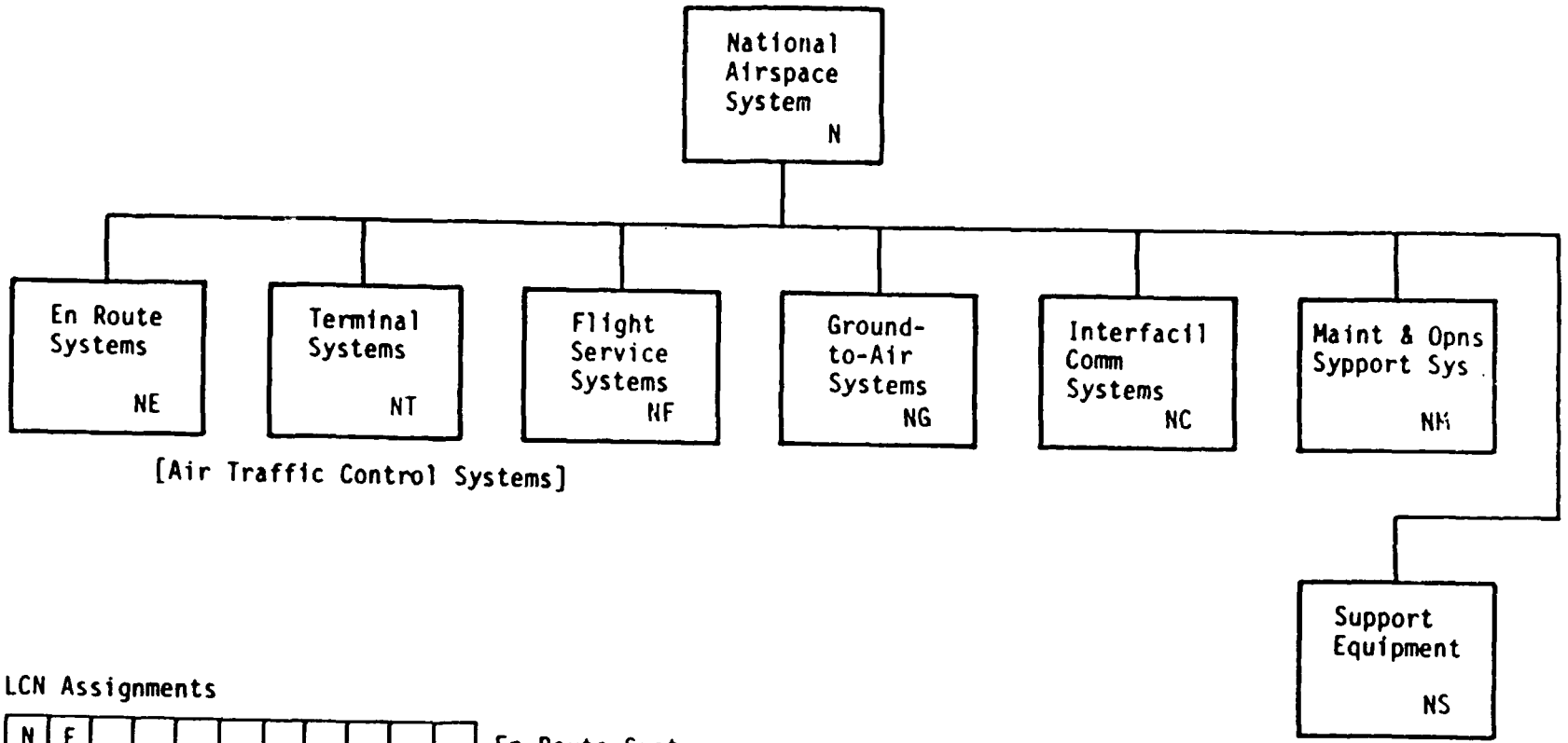
Indenture Levels 4 and On Can Be One or More Characters as Agreed Upon between the Contractor and FAA/SEI

Figure A-1 Logistics Control Number (LCN) Structure



*Indenture Level 4 and On Can Be One or More Characters As Agreed Upon between the Contractor and FAA/SEI

Figure A-2 NAS Contractor LCN Assignment Method



LCN Assignments

N	E	En Route Systems
N	T	Terminal Systems
N	F	Flight Service Systems
N	G	Ground-to-Air Systems
N	C	Interfacility Communications Systems
N	M	Maintenance and Operations Support Systems
N	S	Support Equipment

Figure A-3 NAS Top Level LCN Assignments

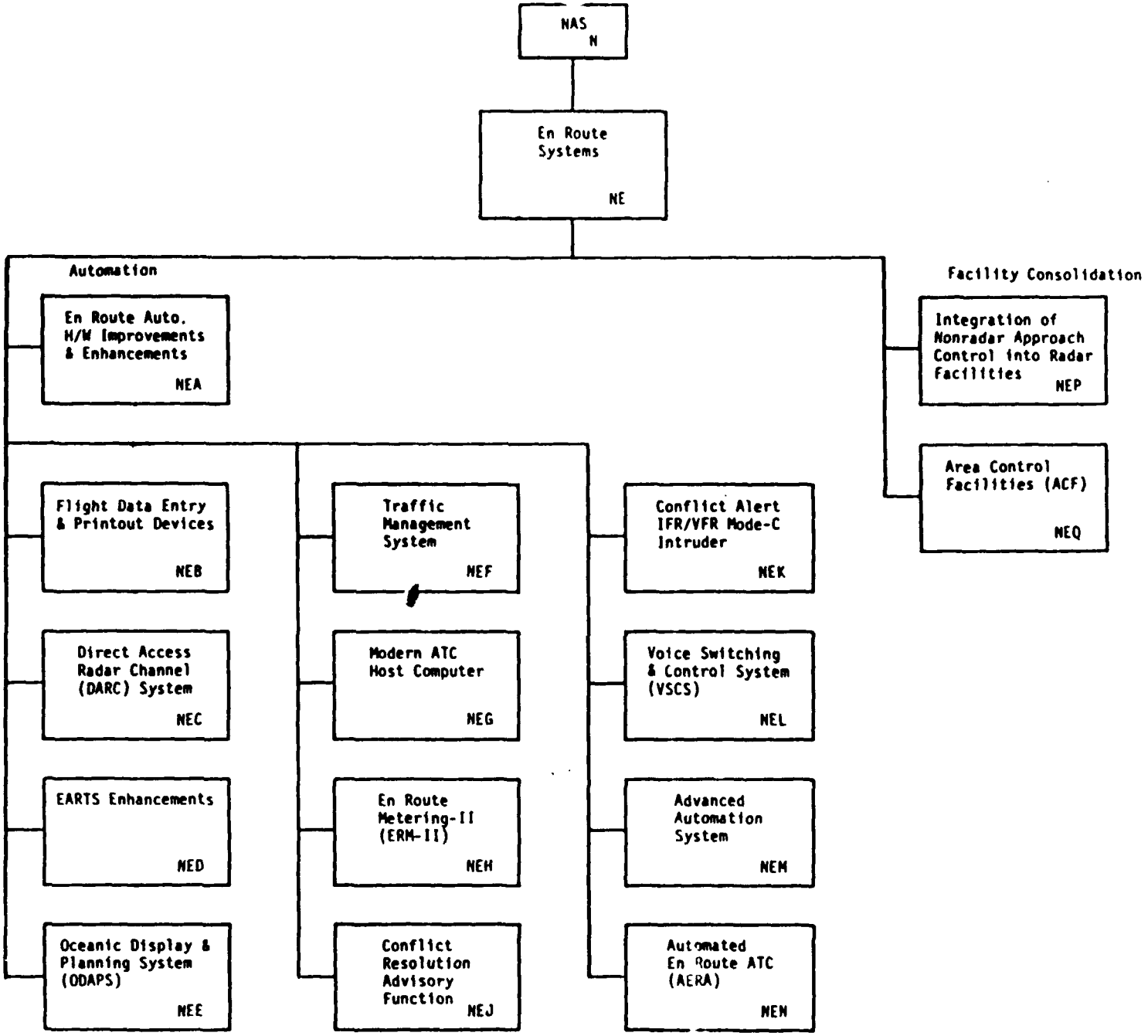


Figure A-4 NAS En Route Systems LCN Assignments

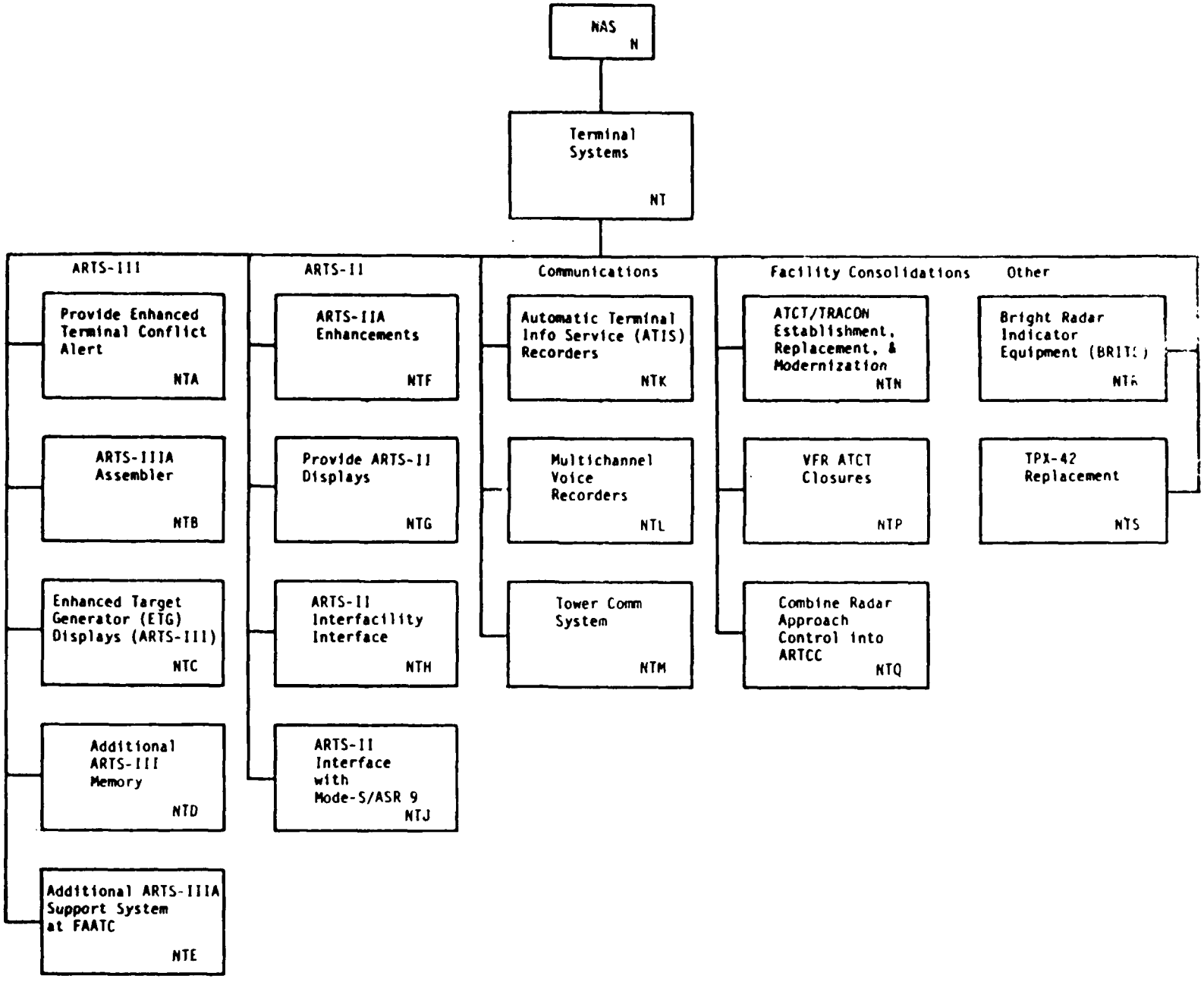


Figure A-5 NAS Terminal Systems LCN Assignments

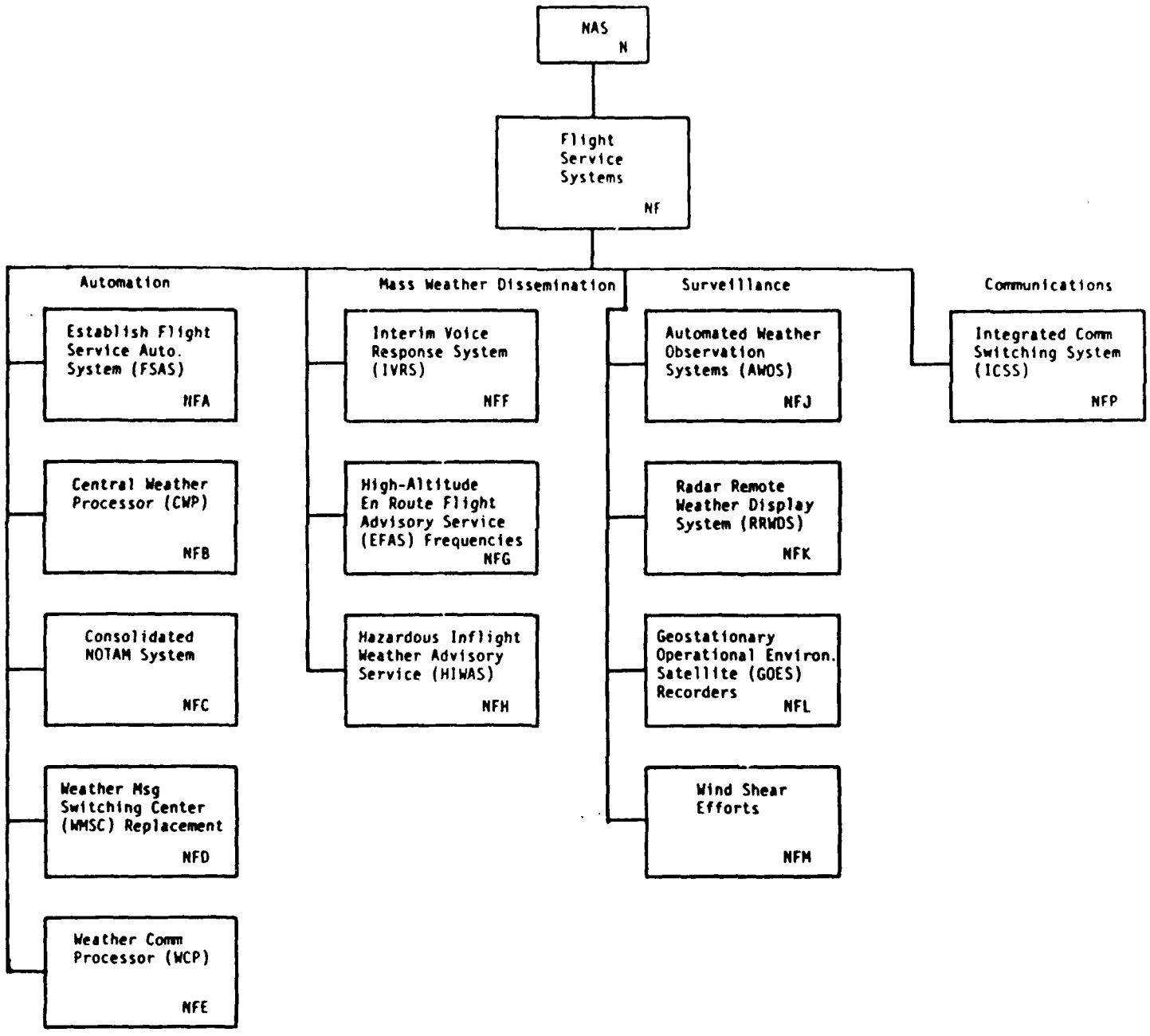


Figure A-6 NAS Flight Service Systems LCN Assignments

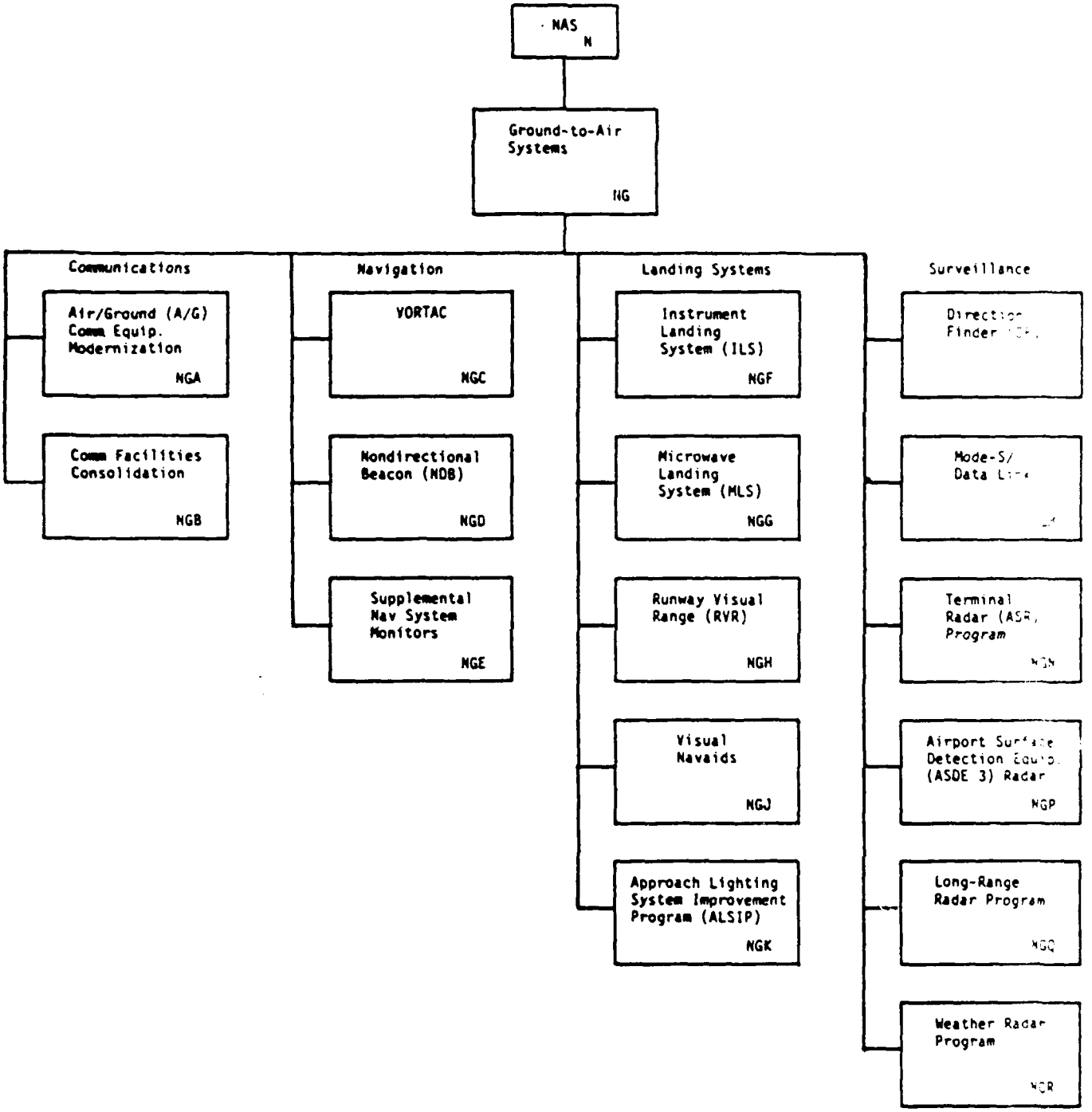


Figure A-7 NAS Ground-to-Air Systems LCN Assignments

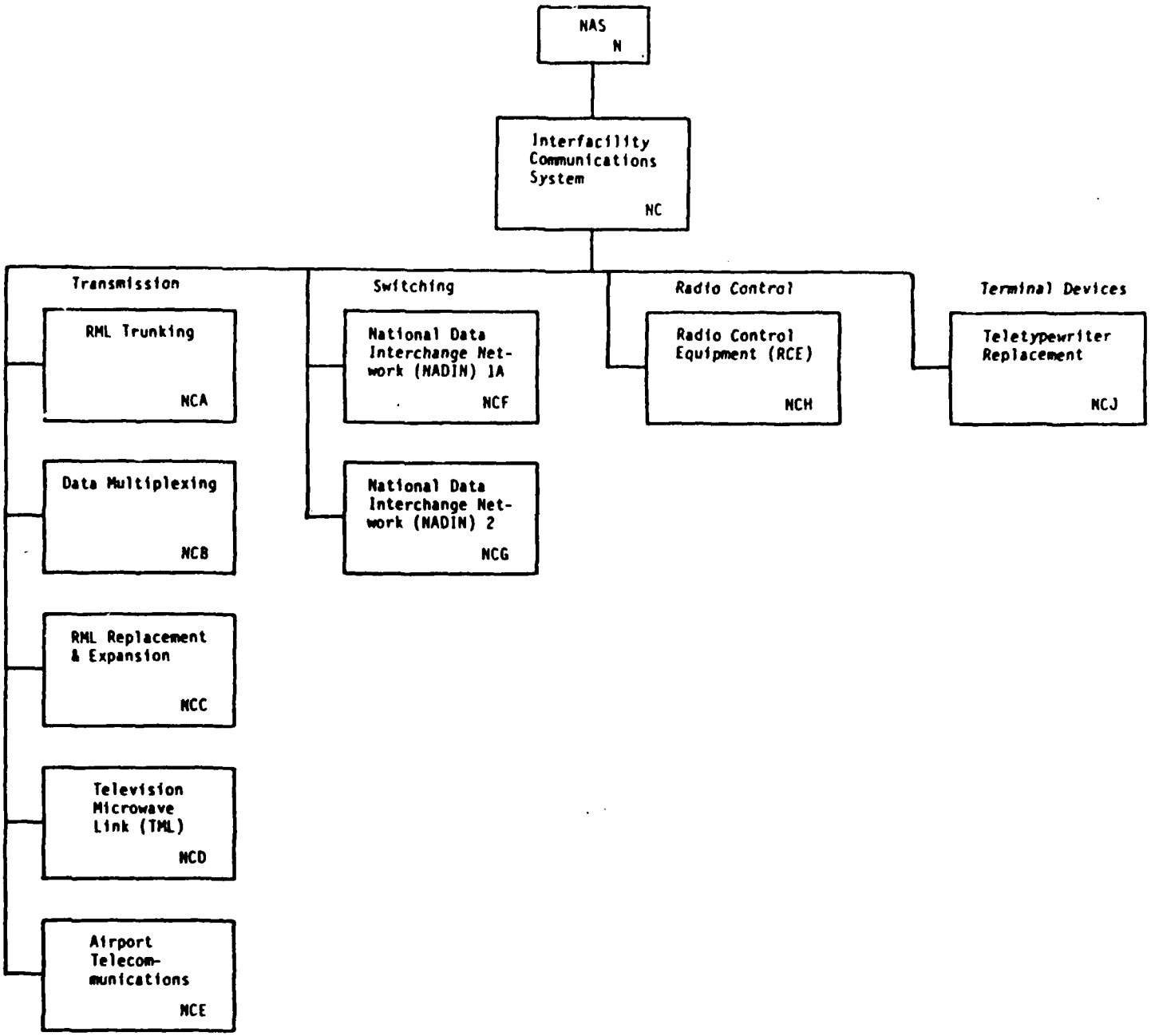


Figure A-8 NAS Interfacility Communications Systems LCN Assignments

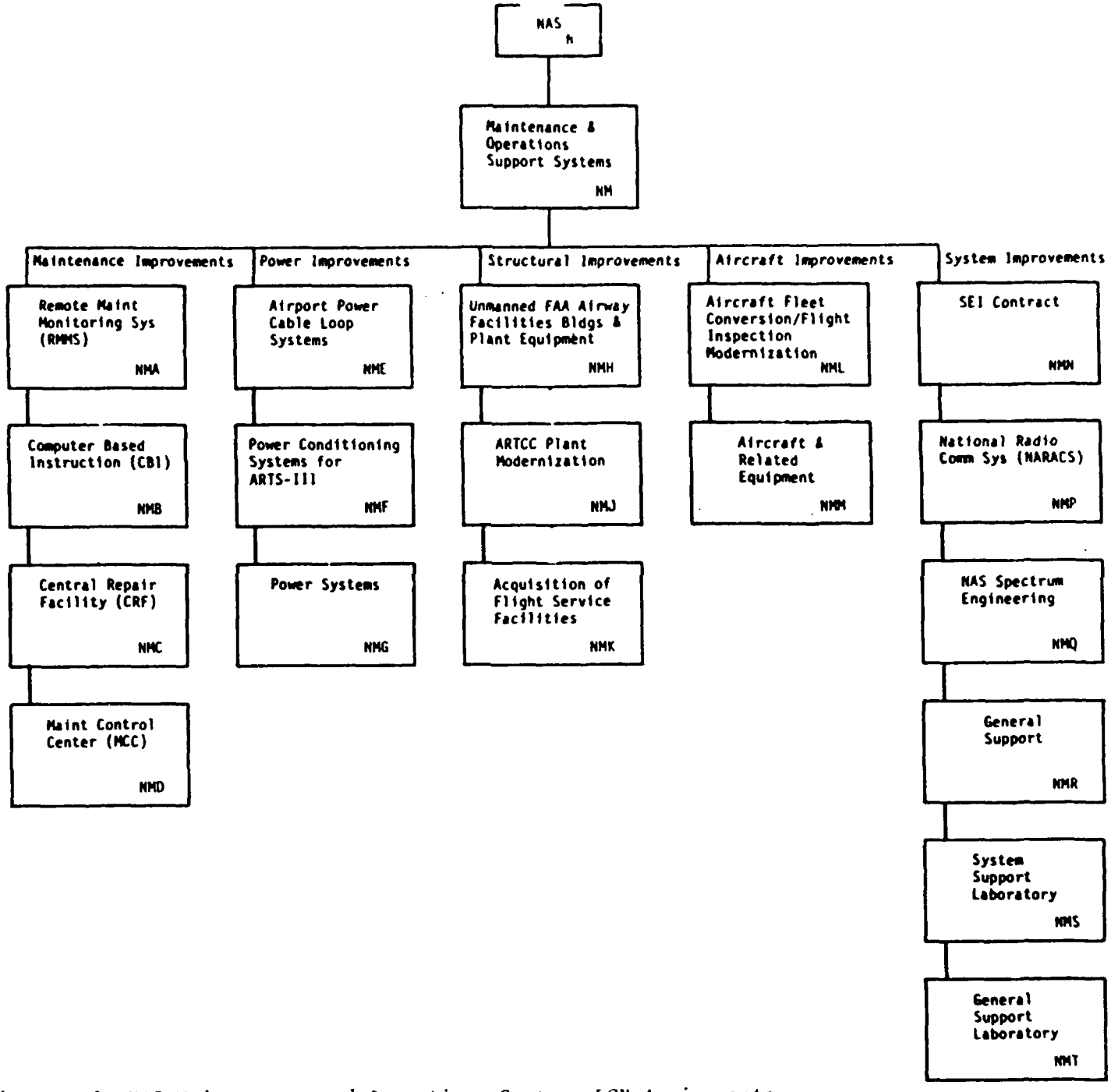
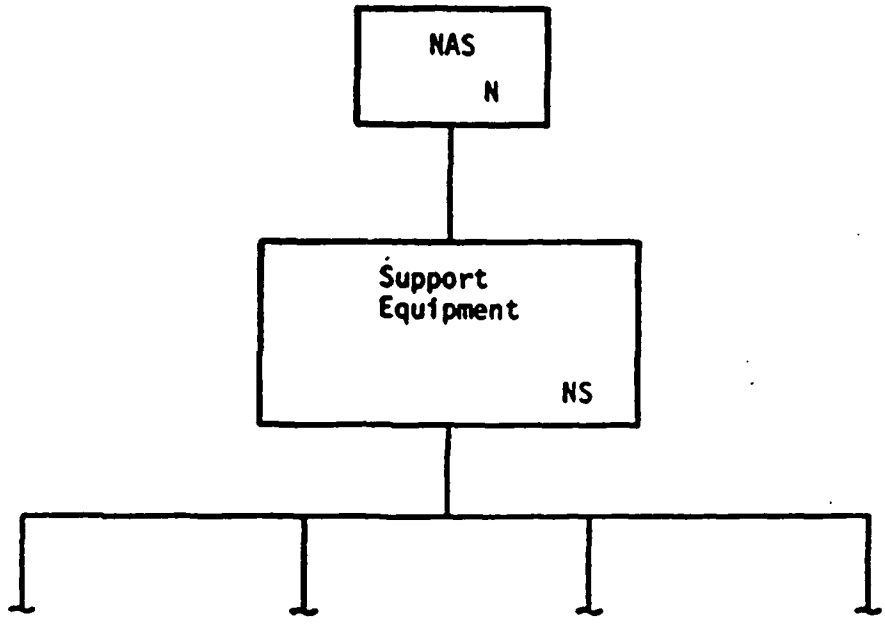


Figure A-9 NAS Maintenance and Operations Systems LCN Assignments



Identifies all NAS-Unique Support Equipment Requiring LSA; LCN's Requested by Contractors and Approved by FAA/SEI

Figure A-10 NAS Support Equipment LCN Assignments